2017 NOAA Satellite Conference

Research Careers in the Private Sector

Dr. T Scott Zaccheo
Atmospheric and Environmental Research, Inc.
Lexington MA

Lexington MA   *Greenbelt MD*   *Boulder CO*
Albuquerque NM   *Hampton VA*   *Norman OK*

Atmospheric and Environmental Research

Our portfolio …

Satellites & Remote Sensing	**Oceanography, Weather & Space**	**Defense & Intelligence**	**Environmental Modeling**	**Climate & Terrestrial Environment**

- **Delivering science-based solutions and actionable data to US government, Department of Defense, international and commercial customers**
- **Spending over forty years advancing environmental science and applications**
- **Providing scientific capabilities in remote sensing, weather, oceanography, space physics, and climate are unmatched in the commercial sector**
- **Activing as partners with leading national and international research institutions**

Advancing Environmental Science.
Delivering Actionable Intelligence.

The Remote Sensing System Value Chain

System Architecture & Impacts → **Remote Sensing Algorithms & Science** → **Operational Systems and Software** → **Production, Operations and Support**

GOES-R (NOAA/ NESDIS)

Geostationary Operational Environmental Satellite
- GOES-R Level 1 & 2 algorithms and product monitoring
- Algorithm testing and production framework (AWB)

DMSP (AF/ SMC, 557th WW, AFRL)

Defense Meteorological Satellite Program
- Electro-optic, microwave and space environment sensor algorithms; Cloud Depiction and Forecast System II
- Weather Satellite Follow-on (WSF)

Commercial Space – GeoOptics
- Observing System Simulation Experiment (OSSE) of GNSS Radio Occultation impact on severe weather forecasting
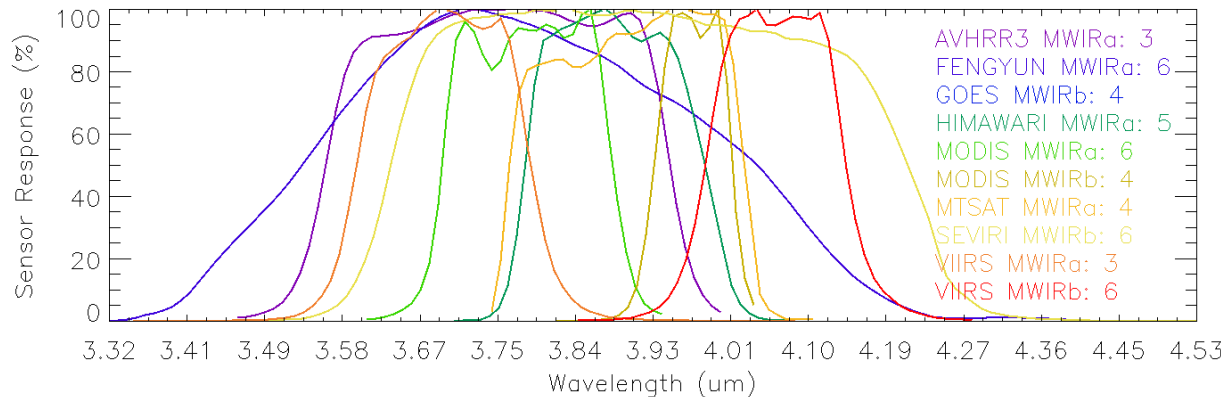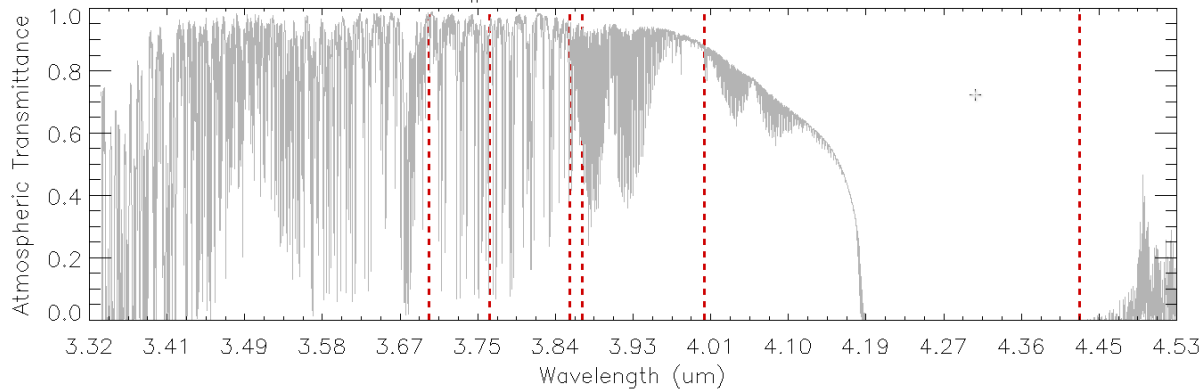
C/NOFS (AF/ AFRL)

Communications/Navigation Outage Forecasting System
- Operational ground processing and data distribution; space weather modeling and research

Radiative Transfer Modeling at AER
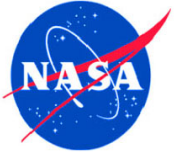
ECMWF Profile #44: Tsfc = 297.7 K, PW = 29.0 mm

Example of OSS Efficiency:
Radiances for 10 Channels Modeled at High Accuracy with 6 Monochromatic Radiances

- **Line-by-line Radiative Transfer Model – LBLRTM, CLBLM**

- **Optimal Spectral Sampling -- OSS (JCSDA, EUMETSAT)**

- **Rapid RTM or RRTM (ECMWF, NCEP, NCAR CCM3)**

- **Monochromatic Radiative Transfer Model (MonoRTM)**

GOES-R and a Vision for Future Remote Sensing Ground Processing

- **GOES-R**
  - Implemented operational algorithm software to produce all GOES-R Level 1 and Level 2 products
  - Product quality monitoring
  - Worked closely with instrument manufacturers and NOAA and academic algorithm scientists
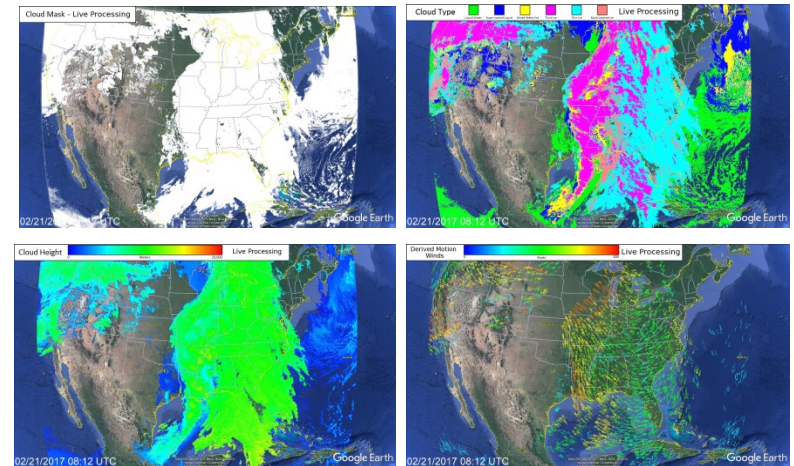
- **Next Generation Remote Sensing Ground Processing – Moving toward open architecture standards**
  - Common interfaces across development and production
  - Interoperability across platform
 - Some of these ideas have been demonstrated on GOES-R – Algorithm Workbench

Algorithm as Components
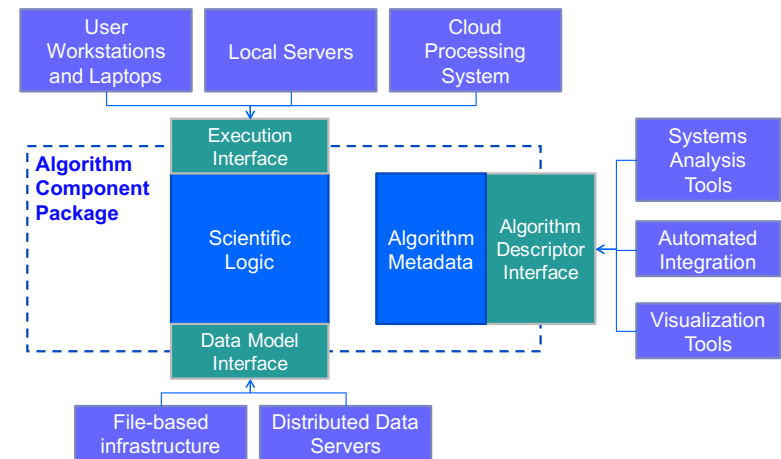
Greenhouse Gas Monitoring: Ground and Space

- **Pre-Definition of Instruments for Active Sensing Trace Gases from Space (ASCENDS)**
  - Assessing uncertainties in Wx and RT modeling errors on retrieval of trace gas observations
  - Developing retrieval algorithms
  - Exploring impact observation on regional and global flux modeling approaches

CO_2 Deployment in Paris, FR

- **Greenhouse gas Laser Imaging Tomography Experiment (GreenLITE)**
  - Collaboration between AER and the Harris Corp
  - Provides 24/7 real-time measurements of near-surface concentrations and 2-D distributions of CO_2/CH_4 over extended urban area
  - Ongoing system validation and extensions of approach to health and safety monitoring applications
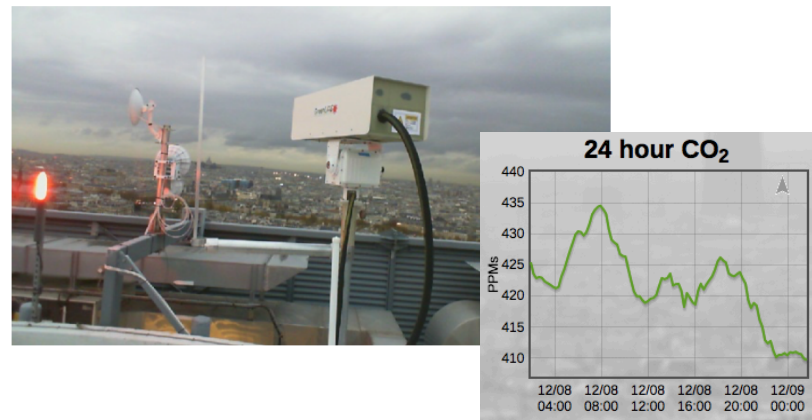
Detection of 2-D CH_4 Plume and Emission Estimation